

Slack *vs* Sub-Scald for Broilers

R53-34

Should the armed forces accept chickens scalded at temperatures above 130° F.? The Quartermaster Food and Container Institute made studies to answer this question and found chickens scalded at 140° F. acceptable.

▶▶▶ THE Armed Forces purchase millions of pounds of chickens annually through the Quartermaster Market Center System, Chicago, Illinois, which has branch Market Centers and field buying offices in major marketing areas throughout the United States.

The processing and quality requirements for chickens procured by the QM Market Center System are stipulated in Military Specification, MIL-C-10467A, which was prepared by the Quartermaster Food and Container Institute for the Armed Forces. The present specifi-

Center and the QM Institute about a year and a half ago. It was therefore decided to investigate whether or not higher scalding temperatures should be authorized. Advice of research and production people in Industry, universities, and the U. S. Department of Agriculture was sought and considered in planning such a test. It was decided to make a direct comparison of slack-(130 degrees F.) and sub-(140 degrees F.) scalding. The test was set up so as to compare them under a variety of processing and packaging conditions.

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ing and evisceration line was used each of the scalding conditions. Freezing was accomplished at -20 degrees F.; the holding temperature (until shipment to Chicago) was 0 degrees F. The experimental birds were shipped by refrigerated truck to Chicago and were then stored in a commercial cold storage plant at 0 degrees to -10 degrees F.

Withdrawals from storage were made at four periods, (i.e., at 3, 6, 9, and 13 months); five birds from each treatment were selected for evaluation at each session.



The panel of expert judges made up of representatives of industry, United States Department of Agriculture, University of California, Army Veterinary Corps, and the QM Market Center are examining the ready-to-cook, whole chickens.

cation restricts scalding temperature to a maximum of 130 degrees F. At the time this was prepared not enough was known about the effect of scalding temperatures higher than 130 degrees F. on the storage life of chickens purchased for Armed Forces' use. In the last several years several commercial processors have been using higher temperatures, however, and apparently with success.

Requests for approval of higher scalding temperatures for chickens, based on claims of providing an equal product at less cost, began to come into the Market

The first study was started in August, 1951. Approximately 1,000 12-week New Hampshire broilers from a single flock were used. The Rockingham Poultry Marketing Cooperative, Broadway, Virginia, assisted in selecting the live chickens, and did the processing. These chickens had been grown under commercial conditions common to the Shenandoah Valley (Virginia); the feed was one of the popular broiler mashes of the region.

Conventional dressing and eviscerating equipment was used; the same dress-

Different Treatments Tested

In order to detect any possible differences that might occur in both the control and test lots, the chickens were chilled, cut-up, or left whole and packaged differently for comparison purposes. Part were eviscerated warm and left whole and then ice chilled. Others were chilled in either air or ice before evisceration. One-half of each lot were individually and tightly wrapped in waxed paper. The other half were enclosed in polyethylene bags and tied.

Other lots were treated similarly except they were cut up and individually packaged in waxed, set-up cartons lined with MSAT cellophane.

Laboratory Tests Conducted

The birds were scored for quality in the frozen state by organoleptic means. Experienced research and production personnel made up the panel of 12 to 14 judges. The chickens were evaluated in; (a) the frozen, (b) the thawed, and (c) the cooked state. Frozen birds were evaluated on the first day of each evaluation period; thawed ones on the morning of the second day; and, cooked

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ones in the afternoon of the second day. The chickens were presented for both the frozen and thawed evaluations on a tray, the five chickens on each being from a single treatment. All samples were code marked to conceal true identity from the judges.

Preparatory to evaluating the cooked product, three chickens from each of the trays were taken at random following evaluation of the chickens in the thawed state. Legs, thighs, and breasts were separated from the balance of the carcasses and placed on coded trays. The breasts were split and cooked, skin-side up, alongside the thighs and legs; no seasoning was used. Two bakery reel-type ovens were used in the cooking.

At each of the sessions, the chickens were graded on a 9-point scale, 9 representing the highest quality. Frozen birds were graded for appearance; thawed birds for appearance and for odor; cooked birds for appearance, texture and flavor.

Field Test Conducted

Due to the large number of samples involved and the expertness of the judges, small differences in mean scores among lots in the first test showed statistical significance. It seemed probable, however, that Armed Forces food service personnel as well as the soldier-consumers would not be able to detect such small differences—nor be so critical of them, if detected. It seemed advisable, therefore, to conduct a field test to determine the response of the final judge—the ultimate military consumer to chickens scalded at 130 degrees to 140 degrees F.

The field test was planned by the QM Institute and submitted to the Quartermaster Board for staging at Fort Lee (Virginia). As in the first test, New Hampshire broilers were used. The chickens were scalded at the control and test scalding temperature, eviscerated warm, then ice chilled to 40 degrees F. (internal breast temperature), individually wrapped in waxed paper, packed in wirebound wood-veneer box, frozen and delivered to Fort Lee in a refrigerated truck. Throughout processing, care was exercised to assure that the scalding temperature was the only variable involved.

The frozen chickens, after delivery to the Army kitchen at Fort Lee, were thawed overnight by removing the wrapped chickens from the boxes and spreading them over tables. This thawing method is the prevailing one in Armed Forces' use. The most frequently used fryer chicken cooking recipe is "deep-fat, southern fried" [i.e., dipping the chicken (in this case, a full half) in flour containing seasoning, then in a milk and egg mixture, and finally in a flour mixture.] This recipe was used for preparing the chickens for testing.

Armed Forces consuming personnel ordinarily see only the cooked chicken; food service personnel (mess stewards, cooks, etc.) see not only the cooked chicken but the frozen and thawed chickens as well. Accordingly, the cooked birds were evaluated by consuming personnel; the thawed and frozen chickens by food service personnel. Over 50 mess stewards and first cooks (food service personnel) evaluated the birds for frozen and thawed appearance. Over 600 soldier-consumers evaluated

amount of time required to chill them.

3. During holding of the chickens in ice, the skin was kept moist. This condition made it difficult to detect the small and scattered areas where the epidermal layer of skin had been removed. This was not true for the air chilled chickens in which case the areas darkened considerably and provided a patchy appearance that detracted from their attractiveness.

Test Scald (140 degrees F.) observations were:



Cooked chicken parts are shown being removed during the tests from the laboratory ovens of the Experimental Cookery Division of the QM Food and Container Institute.

the cooked chicken. Both ratings were made on a 9-point like-dislike scale.

Processing Observations Made (Laboratory Test)

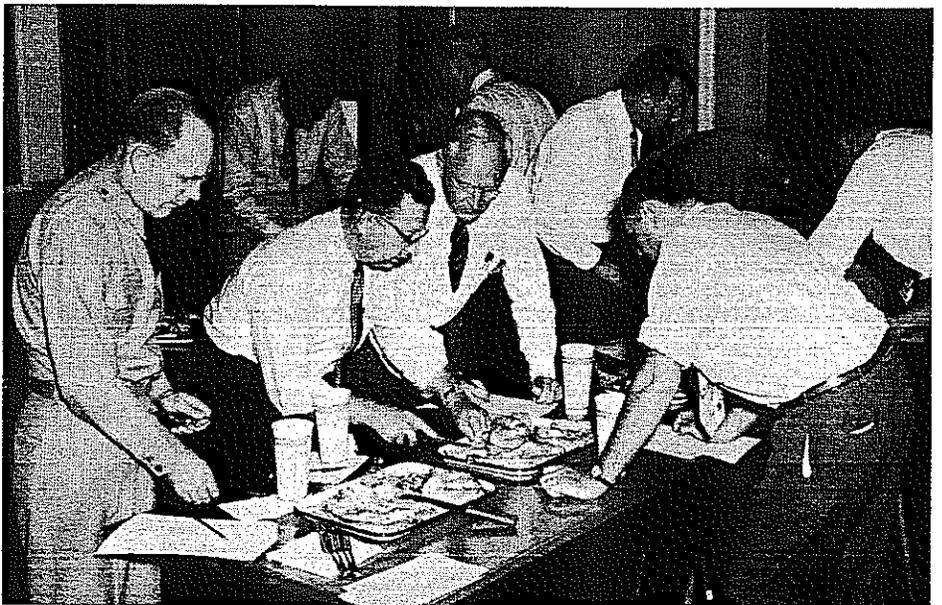
Control Scald (130 degrees F.) The following observations were made:

1. Epidermal layer of skin remained intact on the chickens except for occasional small and scattered areas.

2. Ice chilled chickens retained a good uniform yellow color regardless of the

1. Feather removal was much easier than for the control, and, therefore fewer mechanical pickers and roughers as well as less pinning personnel would have been needed for the dressing operations.

2. Epidermal layer of skin was completely removed except for small areas under wings and on the thighs. Official observers agreed that rearrangement of the machine would provide birds completely free of epidermal layer. The resultant coloring was a uniform bleached pink and somewhat glossy appearance.



The cooked chicken parts are being examined by members of the panel of judges.

The surface acquired a slight stickiness to the touch after exposure to the air for a few minutes.

3. Ice chilled chickens retained the original freshly dressed appearance and color throughout holding in ice.

4. During air chilling and within two or three hours after entering the refrigerated room, the chickens took on a glossy appearance and a "dressed rabbit" color which gradually darkened with time. Stickiness of the surface continued and was slightly accentuated with time.

Laboratory Test Results

Frozen Chickens (appearance) 1. There was a significant preference on the part of the panel for chickens scalded at the control temperature as opposed to the test temperature. Data were combined from all storage times, and processing and packaging variables.

2. The panel preferred the chickens scalded at 130 degrees F. at the three and six month tests. There was no significant difference at nine and 13 months.

Some of the more frequently used reasons for the lowered preference for the test chickens at the three and six months' evaluation were discoloration, and the bleached and transparent appearance.

Thawed Chickens (appearance)

1. There was a significant preference for chickens scalded at the control temperature as opposed to the test temperature. Data were combined from all storage times and processing and packaging variables.

Some of the more frequently used reasons for the lowered preference for the test chickens at the three, six, and nine month evaluations were discoloration, transparency, dark when dry, bleached when wet, and sticky or glossy appearance. The test chickens were preferred at the 13 month period. The reason for

lowering of preference ratings for the control chickens at 13 months is not readily discernible. It may have been due to "pock" marking caused by dehydration at the feather follicle.

Cooked Chickens (texture)

1. There was a significant preference for chickens scalded at the control temperature as opposed to the test temperature. Data were combined from all storage times and processing variables.

The more frequently used reasons for loss of preference of the test chickens at each evaluation were *tough* and *dry*.

Cooked Chickens (flavor)

1. There was no significant preference for chickens scalded at the control temperature and the test temperature when data were combined for all storage periods and processing variables.

The food service personnel (mess stewards, cooks, etc.) detected no significant difference in the frozen or thawed chickens when they were submitted to them at Fort Lee, Virginia for the field test.

The soldier-consumers detected no significant difference in the cooked chickens as served to them.

Scalding Temperatures Permitted to 140 degrees F.

The effects of the other variables on the quality and storage life of the poultry scalded at the two temperatures have not been completely evaluated. The effects of packaging were not large. The birds kept remarkably well considering the test ran for 13 months. Difference in chilling and holding prior to evisceration were not large but the data have not been analyzed to determine significance.

Information and data presented in this report show that the experienced poultry evaluation panel prefer the appearance of frozen and thawed birds and texture of the cooked ones scalded at

the control scalding temperature (130 degrees F.) to those scalded at the test scalding temperature (140 degrees F.). The difference in preference was significant but not large. On the other hand, Army food service personnel and soldier-consumers could detect no difference.

Based on these findings and economic considerations, a decision has been made to permit scalding temperatures up to and including 140 degrees F. for chickens procured according to the requirements of Military Specification, MIL-C-10467A. This change to the specification which will permit the use of the 140 degree F. scalding temperature requires that: (1) the chickens shall be immersed in water for only such time as is necessary to insure satisfactory feather removal without imparting a cooked appearance to the skin and the flesh directly under the skin; (2) the chickens shall not be air chilled; and (3) at no time shall the skin be permitted to become dry prior to delivery of fresh chilled birds or freezing (if freezing is specified).

Acknowledgement

Many individuals and organizations contributed to this investigation. Special acknowledgement is due the judging panel, made up of representatives of Industry, U. S. Department of Agriculture, University of California, Army Veterinary Corps, and the Quartermaster Market Center System. As indicated, the Rockingham Poultry Marketing Cooperative, Inc., processed the chickens for both tests and deserve special mention. The Experimental Cookery Division and the Statistical Branch, Food Acceptance Division, QM Food and Container Institute, provided invaluable assistance in various of the investigative phases of the study, notably, the cooking of the chickens for the laboratory study and the submission of the data to statistical analysis.